Lead Treatment

Lead Experience

Chemistry

TRC's (formerly RMT's) Applied Chemistry team is unique in its approach to developing site-specific stabilization chemistries for all RCRA metals, as well as the additional metals listed in the Phase IV Land Disposal Regulations. Relying on the resources of TRC's state-of- the-art Applied Chemistry laboratory, the TRC metals treatment team has developed stabilization approaches that convert metals to forms that do not leach in either the environment or regulatory tests. With an understanding of the potential for both short- and long-term stability within specific treatment scenarios, TRC's skilled chemists provide solutions that balance environmental protection, health and safety, and cost-effectiveness.

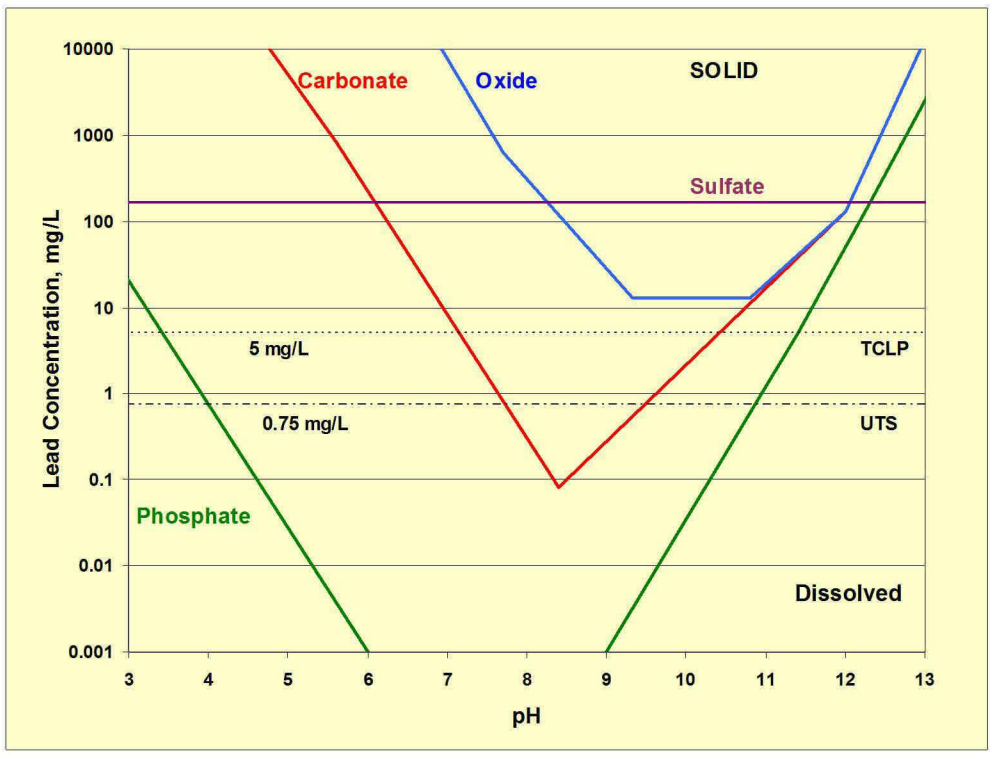
Different metals require different treatment chemistries. To illustrate our approach, we can look at lead. Lead is one of the most frequently encountered metal contaminants of concern. However, it is typically treated with a focus on passing the TCLP test only. TRC offers a different approach. Understanding that the solubility of lead is pH-dependent (Figure 1), and that lead phosphate compounds are very stable, TRC's treatment forms lead phosphates while buffering pH in the range of 6 to 10. This combination of treatment goals ensures that the lead will remain in a stable form for a long time. In fact, the lead compounds formed generally become even more stable over time. Another commonly found contaminant is arsenic, which is treated by adding iron-based reagents to form insoluble iron arsenic species.

The treatment reagent is added to the waste matrix with simple mixing techniques. Because the treatment reagent is specifically formulated for the waste being treated, chemical dosage rates remain comparatively low, compared with conventional treatments such as Portland cement or lime. Furthermore, because our goal is to modify the nature of the waste matrix chemically, and not to simply form a hardened mass, no addition of water is required. The result is significantly lower bulking and lower transportation and disposal costs.

Lead Treatment

Figure 1

Solubility of Lead Species as a Function of pH



Comparison with Conventional Chemistries

Dosage rates for stabilizing soil with Portland Cement and lime generally lie in the 10 percent to 20 percent range. With the TRC reagent, soil is typically stabilized with dosages of less than 5 percent. For industrial wastes, where cement dosages may be as high as 30 percent, the reagent is typically effective at dosage rates of 2.5 percent to 10 percent. Besides providing for a more cost-effective stabilization, the reagent provides for a more sound stabilization chemistry than lime or Portland Cement. Because these lime-based reagents contain highly alkaline material, they raise the pH of water to values in excess of 12. So, even though they can "treat" wastes by neutralizing the acid in the TCLP and meet a regulatory criterion, they can mobilize lead in treated wastes that contact rainwater or groundwater. With the reagent, the lead remains stable under all reasonable leaching scenarios. Table 1 shows the superior performance of TRC's treatment reagent compared to conventional treatment methods.

Table 1

Treatment of a TCLP-Hazardous Metal Processing Waste

	TCLP (Acid) Leach Test		Hazardous Waste Criterion (mg/L)	SPLP Acid Rain (Water) Test	
	Lead (mg/L)	Final pHf		Lead (mg/L)	Final pHf
Untreated	600	6.0	5.0	<0.003	8.2
Lime (Calcium Hydroxide) (% by weight)					
+5%	76	6.5	5.0	290	12.2
+10%	0.2	8.6	5.0	540	12.5
+15%	6.2	10.4	5.0	510	12.5
Portland Cement (% by weight)					
+5%	450	5.3	5.0	19	11.5
+15%	< 0.2	10.4	5.0	11	11.9
+25%	1.2	11.6	5.0	12	11.9

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+50%	10.0	12.0	5.0	3.0	12.1
EnviroBlend® (% by weight)					
+4%	2.4	5.8	5.0	<0.003	10.6
+6%	0.4	5.5	5.0	<0.003	10.3
+8%	< 0.2	5.6	5.0	<0.003	8.5

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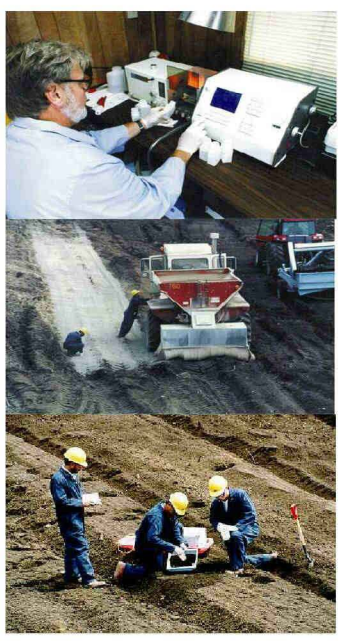
Lead Remediation

East Penn Manufacturing – Pennsylvania

- Managed construction activities, including excavation, stabilization, placement, and structural compaction of over 30,000 tons of lead-contaminated soil and battery casings at an acid battery manufacturing plant.
- Managed remedial closure of two solid waste units.
- Placed stabilized soil and battery casings into the former ore pit and structurally compacted the material to accommodate future upgrades to the facility. This saved the expense and liability of disposing these materials off-site. (#70999)



Wausau Battery Site – Wisconsin

- Remediated 55,000 cu. yd. of battery reclaiming residue *in situ*.
- Used conventional construction equipment to mix materials, including some material below the water table. Monitoring has confirmed that treatment chemicals have not affected the groundwater.
- Reduced costs by approximately 55% by utilizing approved field screening method and a mobile lab for determining lead and treatment additive concentrations.
- Avoided RCRA hazardous waste permitting requirements.
- Reduced overall remediation costs by $10-15 million compared to traditional (dig and haul) alternatives. (#10001)

Diamond State Salvage Superfund Site – Delaware

- Treated over 11,000 tons of lead-hazardous soil *ex situ* using TRC's treatment reagent at a former salvage yard.
- Reduced the cost for transportation and disposal of the treated soil by using a low dosage rate.
- Disposed treated material off-site in a Subtitle D and TSCA landfill.
- Completed project in less than 7 working days. (#5352)

GNB Technologies, Inc. – Illinois

- Remediated 30,000 tons of soil, initially *ex situ* with a pugmill, with subsequent phases treated *in situ*.
- Used the treated material to construct a surface water diversion berm, saving the time and expense of hauling the treated material to a Subtitle D landfill.
- After the Illinois DOT identified impacted soil at another area of the facility due to a right-of-way expansion project, also treated this area *in situ* with IEPA and IDOT approval.
- Saved the client approximately $600,000. (#3083)

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Speakman Company Foundry Sand Site – Delaware

- Remediated over 5,000 tons of lead-impacted soil *in situ* at an operating manufacturing facility.
- Performed work under the Voluntary Cleanup Program (VCP), which required the preparation of a remedial action workplan and a documentation report subject to public comment and review.
- Completed work on a 0.5-acre site in a mixed residential and commercial area without affecting neighboring properties.
- Completed the project at a total project cost that was over 60 percent less than the cost of hazardous waste disposal. (#4811)

Columbia Development Corporation – South Carolina

- Remediated over 500 tons of lead-impacted soil at a potential brownfield redevelopment site.
- Rendered the soil nonhazardous without additional treatment.
- Met the client's 2-week time frame, completing the project prior to implementation of UTS standards.
- Performed the project at one half the cost of the alternative—disposal in a hazardous waste landfill. (#4820)

Fairmont Battery Site – Riley County, Kansas

- Conducted a time-critical removal action to clean up a site purchased as part of a residential relocation program.
- Provided construction management for *in situ* treatment and stabilization of 3,700 cubic yards of soil impacted with lead from crushed batteries.
- Removed impacted soil and disposed it in an off-site landfill, and backfilled excavations with general fill.
- Completed the project within 1 month of authorization, enabling the client to meet the regulatory deadline.

The state agency was "very appreciative of the cooperative efforts by the County and its contractor TRC in addressing this site, and the work was performed in a quality manner." (#4742)

Former Manufacturing Facility – Southeastern U.S.

- Provided construction management for the treatment and off-site disposal of over 3,000 tons of foreign materials and adjacent soil that were impacted by total concentrations of lead that averaged over 48,000 ppm.
- Determined that a reasonably low dosage would be effective, which resulted in treatment bulking of less than 8 percent additional weight.
- Performed treatment, confirmation sampling, site restoration, and disposal of the treated material at a Subtitle D permitted landfill in less than 4 weeks.
- Performed work in accordance with the governing agency's Voluntary Cleanup program and with limited agency involvement.
- Performed total treatment and nonhazardous disposal for less than half of the cost of hazardous waste disposal. (#70227)

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LeMac Foundry – Pennsylvania

- Rendered over 350 tons of lead-affected soil nonhazardous using TRC's treatment chemical.
- Transported and disposed the treated soil at a Subtitle D landfill, which provided significant savings over disposing at a hazardous waste landfill. (#5320)

Home Depot – Pennsylvania

- Treated over 500 tons of lead-impacted soil from a former police pistol range to render the soil nonhazardous.
- Placed treated soil on-site under the direction of the PaDEP under the new progressive Act II guidelines.
- Placed soil 20 feet below the parking lot of the new Home depot constructed at the property, which saved transportation and disposal costs. (#4761)

C&R Battery Superfund Site – Virginia

- Used TRC's treatment reagent to remediate 38,000 cu. yd. of soil with a pugmill. Treated material was disposed off-site at a Subtitle D landfill.
- Averaged throughput of 1,000 tons per day.
- Reduced bulking of treated material by over 7,500 tons compared to treatment with Portland cement.
- Saved $300,000 compared to alternative technologies. (#70048)

Langley Air Force Base – Virginia

- Treated contaminated soil and sediment from a skeet-shooting range on the shore of Chesapeake Bay.
- Developed stabilization process that simultaneously rendered lead-contaminated soil and sediment nonhazardous and controlled phosphorus leaching to limit impact on the Bay.
- Constructed 1,850 foot–log barrier in Bay to allow removal of 4 million gallons of water from cove to facilitate treatment of contaminated sediment.
- Treated 14,000 cubic yards of contaminated soil and sediment *in situ*.
- Placed treated material in on-site disposal area constructed by TRC.
- Restored shoreline, cove, and remediated upland area in this environmentally sensitive location. (#7802)